CAPCOM Okay, and before that we'd like to take the DSC away from you, please for a while.

SC All yours.

CAPCOM Thank you, and we'd like you to go to POO in accept. We have a P27 state vector update for you.

SC There's POO, and I'm going to accept.

CAPCOM Thank you.

SC All yours.

CAPCOM Which would you like first, the map update or the TEI8?

SC The map would be fine.

CAPCOM Okay, map update. LOS 82 55 54, sunrise 83 05 49, prime meridian 83 11 38, AOS 83 -

PAO Apollo Control here while Mike is passing this update up, we're looking at biomedical data on Jim Lovell. And his mean heart rate is registering 66; his high heart rate over the recent sample period has been 76; his low is - we'll now we have a new data point here so his low is now 70; his mean rate is 74. He must be moving around a little bit. His respiration rate is up some what 20 to 21 and shows an activity mode as normal. Could be that he just went from the couch down to his G&N station removed in the opposite direction. Cabin pressure 4.9; cabin temp 77 degrees where it's been most of the day. Get back now to the update.

CAPCOM Understand.

SC For the TEI pass.

CAPCOM Roger, the TEI8 pass, SPS, G&N 45701 minus 040 plus 157 085 18 19'er04, are you with me so far, over?

SC Roger.

CAPCOM Okay, plus 3 -

PAO Apollo Control here, the crew now is directly opposite the Earth. They're just west the Sea of Tranquility, just south of the Imbrium Sea, southeast of the big crater Aristarchus, and directly east of the enormous Ocean Procellarum. They're only just a few miles north of a cluster of landing sites which are right along the Lunar Equator. They're about 8 degrees, 8 lunar degrees North of the sites, four of them that we consider prime sites in that central Apollo zone which is boxed in by an area of about 45 degrees west by 45 degrees east and running 5 degrees north and south of the Lunar Equator. And that's the area, of course, that the crew concentrated today on their optics check just as well as they're photographic efforts.

CAPCOM 060 left 42 plus 0773 minus 16500 129 82 36256

END OF TAPE

CAPCOM 823 6256 146 4618 north set star remains Sirius, Roger, Roll 129 6155, Yaw 010. For quad Elliott 15 seconds, horizon on a 4-degree line at PGS and requesting you zero the optics. Over.

SC Roger. Went to zero optics.

SC Are you through with the computer, now, Mike?

CAPCOM With your computer P-27 on state vector and then verify it.

SC Roger, we're going to put the GS in quad.

CAPCOM Roger, that's fine.

SC Okay, GEIA, SPS G&N 45701 minus 040 plus 157 085 18 1904 quad 3, 3195 minus 01267 plus 04716 179 08 001, NA plus 00187 33552 311 333 55 42 09090 252, Schuba down 060 rev 4.2 plus 0773 minus 16500 12982 3656 14646 18 3 is rising 129 155 010 4 quad 15 seconds horizon 4 degrees

CAPCOM Apollo 8, Houston.

SC Go ahead, Houston.

CAPCOM Roger. Some time back we noted evidence of a restart in the computer and wondered if you had any remarks about it. Over.

SC I know it. Jim got screwed up on one of those programs. He got kind of tired here and we got a restart and a couple of program alarms. I don't know what he did.

CAPCOM Roger, Frank, the main point is the computer is looking fine to us now.

SC That's good.

SC Houston don't believe all you hear up here.

CAPCOM No, we have a filter Jim, for that.

SC Thank you.

CAPCOM Apollo 8, Houston.

SC Go.

CAPCOM Rog. In some of Jim's previous comments about the limb brightness as the sun was about to come up has sparked a lot of interest down here. And we'd like to ask him if he gets a chance to notice again or perhaps he can recall, were there any changes in the appearances of the stars, such as did he notice any twinkling while this was taking place, and did he notice any narrow limb brightening within 10 to 20 seconds prior to the sun's rising. Over.

SC He'll be with you - he's doing a P-52 now.

CAPCOM Okay.

SC Houston, my comments concerning the sunrise was the comment above the terrain. There appeared what might be called diagonal light or light to the haze or something like that. As the sun came above or before the sun came

SC above the limb, Definite rays can be seen coming from the other side. It was a uniform haze apparently from the center spot where the sun was going to rise. And this was something which I couldn't explain.

CAPCOM Roger, Jim. I believe we copied that and just curious, and if you see it again and if you notice any stars twinkling or any additional information.

SC Will do. Won't have a chance until 20.1.

SC Naturally he doesn't want to pass out too much of that information. He wants to save it and write a paper when he gets back, Mike.

CAPCOM Right then. In German probably, huh.

SC Houston, Apollo 8.

CAPCOM Apollo 8, Houston.

SC Okay, what time is that TV, Mike, 85 by 37?

CAPCOM 85 37 to terminator, which is probably like 86 14.

SC Okay. Well, I don't know if we can go that long with it and I'm going to scrub all the other experiments that converts into stereo or other photography and we are a little bit tired, I want to use that last bit to really make sure we're right for TEI.

CAPCOM Roger. I understand, Frank.

CAPCOM A couple of miscellaneous items for you. We'd like for you to discontinue charging Battery B at this time. We'd also like to get a cryo stir 2 minutes on all four, and your up telemetry IU switch, put to block please and you are go for the next Lunar orbit.

SC Thank you.

CAPCOM Rog.

SC Houston, Apollo 8.

CAPCOM Apollo 8, Houston, go ahead Frank.

SC Rog. I want to scrub these control point sightings on this next rev, so we can let Jim take a rest.

CAPCOM Rog. I understand.

CAPCOM I understand you want to scrub control points 1, 2, and 3 on the next rev and the convereing stereo on the following rev.

SC That's right. We're getting too tired.

CAPCOM Okay, Frank.

END OF TAPE.

CAPCOM Take 41845 remarks control point 1 acquisition 83073 niner. Control point 2 acquisition 832021. Control point acq. 834151. B1 acquisition 840228, over.

SPACECRAFT Roger. A2 5554 A3 0549 A3 1138 834143 841845. CP1 830739, CP2 832021, CP3 834151, B1 840228

CAPCOM That is affirmative.

END OF TAPE

CAPCOM Apollo 8, Houston.
SPACECRAFT Go ahead.
CAPCOM This rev coming up we would like to clarify whether you intend to scrub Control Point 1, 2, and 3 only and do the psuedo landing site or whether you also intend to scrub the psuedo landing site mark, over.
SPACECRAFT We're scrubbing everything. I'll stay up and try and keep the spacecraft vertical and take some automatic pictures but I want Jim and Bill to get some rest.
CAPCOM Roger, I understand.
PAO This is Apollo Control Houston. You heard the last transmission from Frank Borman wherein he indicated that he planned a drastic reduction in activities in the next 4 revs. We've been noting and suggested earlier we had a tired crew. Certainly indicated in Lovell's voice. We heard very little crack from Bill Anders who is presently in a sleep period. It just could be that that will wind up our activities in lunar orbit. There is a conference going on now around the Flight Director's console and it will be from that the ground will make up its mind on what if anything is needed or if anything we might suggest to Borman and that will be the subject of a further conference if anything more was needed. Sounded to me like Frank was very definite that he wanted to wrap it up at this point and certainly let Lovell get some rest before transearth injection burn. The transearth injection burn is planned for 89 hours 15 minutes. The major question in our minds on this particular console is whether the spouting off of activities will include the television transmission on the 9th rev. We don't have the answer to this yet. We should have the answer shortly. At 82 hours 46 minutes into the flight this is Apollo Control Houston.

END OF TAPE

GET 82:58:00

PAO Apollo Control Houston here 82 hours 56 minutes into the flight. We have just lost signal with the spacecraft and I believe you heard earlier Frank Borman declare that he had a tired crew. Jim Lovell was very tired you could tell it from his voice as the afternoon wore on. He said he was relieving him of all further flight plan responsibilities 5 minutes after he said that he came back on the line and said Lovell is snoring already. Here is the last few conversational items with the crew before they went over the hill. Let's have the tape.

CAPCOM Apollo 8 Houston 4 minutes to LOS you have control of the DSE now and all your systems are looking good.

SPACECRAFT Thank you very much, Mike.

CAPCOM You bet.

SPACECRAFT Lovell is snoring already.

CAPCOM Yeah, we can hear him down here.

CAPCOM Apollo 8 Houston.

SPACECRAFT Go ahead.

CAPCOM We have 1 minute to LOS, Frank, you can terminate stiring up your cryos any time and we agree with all your flight plan changes. Have a beautiful backside and we will see you next time out.

SPACECRAFT Thank you.

PAO This is Apollo Control Houston here. You heard Borman and since that camera station the project manager George Low has come over to our console and he said that he urged me to make it very clear that Apollo Spacecraft Program Office is altogether happy with the data they have gotten today and they feel like they have gotten as nearly 100 percent of the data as they could possibly get. He is quite pleased with it and he is ready to give the crew a well earned little extra bonus rest. According to the last information we have from the Flight Director, Cliff Charlesworth and from the incoming Flight Director, we are going through a change of shifts here, we will still have the television pass as scheduled at about 8:25 or 8:27 in Houston time to last approximately 45 minutes. We'll refine more as we get to it. Let me check my log here. We show it scheduled for 85 hours 37 minutes delineated earlier in the day. It used to run to 86 hours 14 minutes. That's elapse time and this is Apollo Control Houston at 82 hours 59 minutes.

END OF TAPE

PAO This is Apollo Control at 83 hours 11 minutes At the present time Apollo 8 is nearing the end of it's seventh revolution. We've had loss of signal now for about 16 minutes. Our displays here in Mission Control Center show that we should reacquire the spacecraft again in about 30 minutes. At the present time here in Mission Control Center, Flight Director Milton Windler is in the process of relieving Clifford Charlesworth, and our Capsule Communicator will be Ken Mattingly replacing Mike Collins in that position. Windler at present is going over the status of the spacecraft and the mission with his team of flight controllers. And as I said we will be reacquiring the spacecraft again in about 30 minutes. At the present time all systems aboard the spacecraft look good, and as you heard in previous conversation shortly before we had loss of signal, Lovell is sleeping at the present time, and the crew is modifying the flight plan to allow both Lovell and Anders to get some sleep or rest at least before the Transearth Injection Maneuver scheduled to occur at 89 hours 15 minutes into the flight. At 83 hours 12 minutes this is Apollo Control, Houston.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 834100, CST 6:32 267/1

PAO This is Apollo Control, Houston, at 83 hours 41 minutes into the mission. We're standing by at this time to reacquire the spacecraft as it comes over the Lunar horizon on it's eighth revolution. Here in Mission Control Center, Flight Director Milton Windler and his team of flight controllers are becoming busily involved in becoming prepared for the Transearth Injection burn scheduled to occur at 89 hours 15 minutes. Particularly the flight dynamics people down in the front of the Control Center. They are of course the gentlemen who will be coming up with the information needed by the crew for the maneuver, and they are very heavily involved in that at the present time. We'll stand by for Capsule Communicator Ken Mattingly to put in a call to the crew as we reacquire at the signal now at about 1 or 2 seconds.

SC Houston, Apollo 8.

CAPCOM Apollo 8, loud and clear.

SC Roger.

PAO This is Apollo Control. During this pass on the eighth revolution across the front side of the Moon, we expect to begin passing up some information to the crew relevant to that Transearth Injection maneuver. We do anticipate that both Lovell and Anders will be resting at this time, shortly before we lost to the spacecraft - lost signal from the spacecraft. On the previous revolution, Borman advised us that Lovell was sleeping, and he said that he had removed a number of items from the flight plan in order that both Jim Lovel and Bill Anders would be able to get some rest before this Transearth Injection maneuver. We'll continue to monitor here and anticipate that we will be having some conversation with Borman shortly.

END OF TAPE

PAO This is Apollo Control at 83 hours 54 minutes. We just put in a call to the spacecraft. Conversation with them at this time and we will pick that up for you at this time.

SPACECRAFT ...

CAPCOM All right Apollo 8. Couple of notes for you. On the P52 you are coming up to on this rev. We've looked at your state vectors and all your information. The platform looks good and feel it is your op if you would like to bypass this P52 your platform will still be good at the following PEI pass and we would like to have your PRD reading and I guess we are behind the sleep summary, over.

SPACECRAFT ... about 3 hours or 4 hours today.

CAPCOM Roger.

SPACECRAFT PRD ... 144.

CAPCOM Copy 144 and we have dump tape ready to go into your computer for the state vector if you want to go to POO and accept.

SPACECRAFT We'll accept.

CAPCOM Thank you.

PAO This is Houston. We're continuing to stand by here for further conversation. At the present time the Spacecraft is transmitting back to us with their omni antennas and there will be about 12 or 13 minutes before we bring on the high gain at that point we would expect that the noise level would drop off somewhat. We are also here in Mission Control going ahead with the TV circuits. Calling up those circuits and maintaining on the assumption that we will have TV transmission at the scheduled time and that is 85 hours 40 minutes ground elapsed time at the beginning we have not had confirmation of that from the crew and as you heard earlier, Borman indicated that he would be deleting some items from the flight plan. However, the feeling at the present time here in the mission control center is that the television transmission will occur on schedule unless we are advised otherwise by the crew. We'll continue to monitor here for a short while. If we don't pick up some conversation, we'll take the circuit down and pick up again when we are in contact with the crew.

SPACECRAFT ... PEI 9 Pad..

CAPCOM Okay, Apollo 8, we have completed with the computer. You can use the vert 47 to transfer and I have the PEI 9 pad.

SPACECRAFT That's ... isn't it. Just a minute and I'll take care of it.

CAPCOM Roger

SPACECRAFT Okay, I went to POO and then vert 47 and I'm ready to copy.

CAPCOM Okay, do you have it in Block?

SPACECRAFT Say again.

CAPCOM I say, do you have the uptelemetry in Block?
SPACECRAFT Roger
CAPCOM Okay. This Pad is a PEI 9 SPS G&N 455 niner 7 minus 040 plus 157 087 1 niner 1820 plus 34188 minus 013 53 plus 00780 180 008 001 November Alfa plus 00187 34223 313 34021 4208 niner 8253 033 down 131 left 28 plus 0758 minus 165 00 12 niner 87 362 77 14648 16 Primary Sirius.

END OF TAPE

CAPCOM 16, primary star Sirius, secondary Rigel, 129 155 010 4 quads 15 seconds ullage, horizons on 1.2 degree window line at T minus 3, use high speed procedure with minus Mike-Alfa. After looking at the burn information from your previous SPS burns, it appears that the engine performance should give us a 3. second burn time, longer than what you have on the pad. The pad number should correspond with what you get out of the computer. So we have not factored this into the past data, however you can anticipate the engine for a normal DELTA-V to give you a 3. second - 3.7 second burn in excess of the computed time, over.

SC Roger, thank you. TEI 9 SPS G&N 45597 minus 040 plus 157 087 19 1820 plus 34188 minus 01353 plus 00780 18008 001 NA plus 00187 34223 313 34021 42 0898 253 033 down 131 left 28 plus 0758 minus 16500 12987 plus, or 36277 1464816 and that's Sirus and Rigel 129155010 4 quads 15 seconds, 1.2 degree on the window at T minus 3, high speed minus MA engine 3.7 seconds longer than the other.

CAPCOM That's affirmative, Apollo 8. And when you get around to it, if you would like for us to dump your tape we can do that when you get on high-gain.

SC Roger. Okay, should have it on the high gain now, Houston.

CAPCOM Roger, and we're going to go ahead and dump the tape.

SC Roger. Ken, will we get the real TEI pad the next time around now?

CAPCOM Apollo 8, we'll have one for you the next time around, and we'll update it if necessary on the following rev.

SC Okay.

PAO At present time the spacecraft is crossing over the Sea of Tranquility, and it's approaching the terminator the point at which it will go into darkness, actually not total darkness. That would be the area of the Moon that would be lighted by Earth shine, and from previous reports - stand by we have a call from the crew.

SC Do you have any idea why quad B seems so much lower in quantity than the other three quads?

CAPCOM Stand by.

END OF TAPE

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Okay. It looks to us like, although we're reading out the same thing you are on the quad quantity, using the computer program and all of the correction factors that are in there, it looks like all four of your quads are very close. In pounds, it looks like you have, for example, 193 pounds in quad A and 189 in B, 200 in C and 190 in Delta and the difference that you read on the gage is attributed to the fact that you don't have all of the correction factors in there. This ground calculations has an accuracy of about plus or minus 6 percent and the best you can do onboard - even using your chart as plus or minus 10 percent. Over.

SC Thank you.

PAO This is Apollo Control at 84 hours 18 minutes. At this point, we have passed all of the information that Flight Director, Milton Windler, wanted to get to the crew on this pass on the 8th revolution and we anticipate that any further conversation with the spacecraft before we lose signal in about 36 minutes, will be initiated by the crew. We'll continue to monitor and pick up the conversation as it develops. At the present time, it appears that Frank Borman is the active crewman. Lovell and Anders, we expect, are getting some rest at this time in preparation for the busy schedule they're going to have during the Trans-earth injection maneuver.

END OF TAPE

PAO This is Apollo Control, Houston. We've had one very brief conversation with the crew since our previous report, and we'll pick that up and come up live with conversation that is developing at this time.

CAPCOM Apollo 8, Houston, the tape recorder is back to you.

SC Thank you.

CAPCOM Apollo 8, Houston.

SC Go ahead.

CAPCOM Okay, we've just finished looking at all your systems and all the trajectory information and you have the go for another rev.

SC I understand we're go for rev 9.

CAPCOM That's affirmative, 8.

SC How's the weather down there, Ken?

CAPCOM It's really beautiful. Loud and clear and just right - the temperature.

SC How about the recovery area?

CAPCOM That's looking real good.

SC Very good.

CAPCOM Yeah. They told us that there is a beautiful moon out there.

SC Now we were just saying that there's a ~~beautiful~~ Earth out there.

CAPCOM It depends on your point of view.

SC Yeah.

CAPCOM If you're looking for things to do up there, Frank, you might look and switch that biomed switch over to the left position.

SC Okay.

SC Are you ready?

CAPCOM All set.

SC 543 - Say it again.

CAPCOM We've got the computer waiting.

SC Ken are you ready - 5 4 3 2 1 mark.

PAO Based on that count from Frank Borman aboard the spacecraft, we've concluded here in Mission Control, we have about a 3-second delay from the time the signal is sent until we receive it here.

SC Houston, Apollo 8.

CAPCOM I'm reading you weak, but clear, Frank.

SC How about this (garble) here, is that any better?

CAPCOM It's a little louder.

PAO This is Apollo Control. At the present time, we seem to be getting a fair amount of noise on the circuit. We'll stand by to pick up conversations again should they develop and take the circuit down at this time.

END OF TAPE.

To Bachelors (A to G
Tape 57 page 2

PAO This is Apollo Control, Houston, at 84 hours 47 minutes into the flight. We've just reviewed with Frank Borman the procedures and plans we have for our television pass coming up on the next revolution, and we'll play back that conversation for you and then continue to follow for any live communications with the spacecraft.

SC Ken, how did you fellows pull duty on Christmas Eve, it happens every time doesn't it.

CAPCOM I wouldn't be anywhere else tonight.

SC Roger. Just finished tracking on this lunar orbit right now.

CAPCOM Okay, Frank, it's looking like it's coming right down the pike, it's doing just what it is supposed to and apparently all our computer programs have got the right numbers in them because they're predicting where you're going.

SC Have they copied any of these anomalies due to high spots?

CAPCOM Roger, detectable but they're not changing things enough to see anything more of interest.

SC Fine, hope they are as good with the starter as they were with the LOI, that was beautiful.

CAPCOM It sure was, that's a text book all the way. Apollo 8, Houston.

SC Go ahead.

CAPCOM Okay, we're about 10 minutes till LOS. We'll be picking you up again at 85 40, and we'll have all of the TV pass information standing ~~by~~. In the event that the situation develops again for pointing accuracies, if anything that looks like a terminator or anything of that nature, I'm going to call the dark side of it 12 o'clock and use that as a reference system. And we'll try that. If that doesn't dope out any problems with camera pointing, why I may try - call for a plus pitch and then I'll just correct what I see to account for it.

SC Roger, we're not going to use the telephoto lens. I don't believe we'll be able to get a picture of the Earth. It's going to have to be the terminator, the lunar surface. I'm looking at the Earth right now; we won't see it again during that period.

CAPCOM Okay, real fine then. And next time around why we'll take an extra special look at all of the perameters; we'll have our TEI pad for you. And we'll use the last rev for a real good check on all systems. I'll give you a run down by system of all things we see, and where they stand.

SC Okay, fine.

CAPCOM Apollo 8, Houston. We're approaching 4 minutes till LOS. All systems are GO.

PAO Part of the transmission on that last conversation was a little bit difficult to copy. We were able to copy Borman saying that he would not be able to get pictures of the Earth on this TV pass coming up on our next revolution. And he indicated that he did not plan to attempt to use the telephoto lens. The estimation here in Mission Control Center is that he will not be in a proper attitude to get a shot out the window of Earth, and therefore would not be using the telephoto lens. We're now 2 minutes 35 seconds away from loss of signal from spacecraft. We'll reacquire again about 46 minutes after we lose contact. At 84 hours 52 minutes into the flight, this is Apollo Control.

END OF TAPE

PAO This is Apollo Control Houston 85 hours 21 minutes into the flight. A little more than 20 minutes since we have been in touch with Apollo 8. We should reacquire in about 18 minutes. To recap a bit the crew was given a few hours extra rest, particular Jim Lovell. On the 7th rev Bill Anders, we presume is also getting some nap time prior to the transearth burn a little later tonight. One or two things might be pointed up from todays revolutions around the earth, we have noted the temperature excursions that have occurred. They weren't entirely unpredicted but the variance interested people here on the console. Excursions over a 50 degree range. Another point that is proving interesting here with the passage of each rev is the fact that our apogee tends to grow ever so slightly and our perigee tends to shrink. This has not been the experience in earth orbital flight. The apogee tends to shrink ever so slightly and the perigee usually remains stable coming down somewhat but it the earth orbital experience is explained by the ever so slight amount of drag exercised on the spacecraft at perigee which tends to cool down the apogee to slow the spacecraft somewhat at perigee and the effect of it comes in at the high point of the orbit then tends to drop it down somewhat. Somewhat the opposite effect seems to be taking place in these revolutions around the Moon. We have plots here on the first rev of 60.5 miles for apogee versus 60.9 perigee. The next rev 60.4 apogee versus 61.7 perigee and a 62 versus 60.1 and a 62.3 apogee versus a 59.8 and the curve continues in that way. It is slight but it is interesting and it does not conform to the earth orbiting experience. Again another reason for wanting to fly this navigational-operational Apollo 8 mission. At 85 hours 24 minutes into the flight this is Apollo Control in Houston.

END OF TAPE

missing 25-74.

Genesis prayer 277/1

(Hard to distinguish between Anders & Borman voices)

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 853900, CST 8:31p, 274/1

PAO Apollo Control, Houston, here. 85 hours 39 minutes and we're very nearly at the acquisition point. Only 10 seconds away. And we should, if we're on plan, move right into a television transmission. The time of 85 hours 45 minutes has been passed to the crew. The prime sight for this picture will be the Goldstone Station from California. We're getting telemetry now via Honeysuckle Creek the dish in Australia. No word yet on Goldstone. Getting a carrier nice, now it should be indicative of transmission coming.

PAO There are still no calls. We are a minute and a half into acquisition. The capsule communicator has been advised to pass to the crew, when we acquire, that all of the systems look good. Ten minutes now since we did acquire the spacecraft. Rather noisy data. The data of the 9th revolution around the moon, we are doing an apogee of 63 miles of a perigee of 58.9 miles, velocity 5352 feet per second. We've got a picture here, but - we've got a voice to go with it. Bill Anders.

SC ~~How does the picture look, Houston.~~

CAPCOM Loud and clear.

SC ~~Does everything~~ look okay?

CAPCOM Rog. Very good.

SC Welcome to the moon, Houston.

CAPCOM Thank you.

CAPCOM We're theorizing here that that bright spot in the top left side of your picture is the earth. That's not very clear.

SC Take a look at the Lunar horizon. We're going to follow a track or to a terminator where we will turn the spacecraft and give you a view of the long shadowed terrain at the terminator which should come in quite well in the TV.

CAPCOM Roger.

SC We don't know whether you can see it from the TV screen, but the road is nothing but a Milky Way. Completely void. We're changing the cameras to the other window now.

SC This is Apollo 8 coming to you live from the moon. We've had to switch the TV cameras now. We showed you first a view of Earth as we've been watching it for the past 16 hours. Now we're switching so that we can show you the moon that we've been flying over at 60 miles altitude for the last 16 hours. Bill Anders, Jim Lovell, and myself have spent the day before Christmas up here doing experiments, taking pictures, and firing our spacecraft engines to maneuver around. What we will do now is follow the trail that we've been following all day and take you on through to the Lunar sunset. The moon is a different thing to each one of us. I think that each one of us - each one carries his own impression

SC of what he's seen today. I know my own impression is that it's a vast, lonely forbidding type existence, great expanse of nothing, that looks rather like clouds and clouds of pumice stone, and it certainly would not appear to be a very inviting place to live or work. Jim what have you thought most about.

SC Well, Frank, my thoughts are very similar. The vast loneliness up here of the moon is awe inspiring and it makes you realize just what you have back there on Earth. The Earth from here is a grand ovation to the big vastness of space.

SC Bill, what do you think?

SC I think the thing that impressed me the most was the Lunar's sunrises and sunsets. These in particular bring out the stark nature of the terrain and the long shadows really bring out the relief that is here and hard to see and is very bright -

END OF TAPE.

SC It is here, and hard to see, at this very bright surface that we're going over right now. Now describe, that's not color, Bill, describe some of the physical features of what you're showing.

CAPCOM Apollo 8, Houston, we're not receiving a picture now, over.

SC We're now coming on to Smyth's Sea, a small mare region covered with a dark level material. There is a fresh bright impact crater region on the edge towards us and a mountain range on the other side. These mountains are the Pyrenees.

CAPCOM Apollo 8, we're not receiving modulation on the signal; we do have sound.

SC Are you reading us Apollo, Houston.

CAPCOM Apollo 8, we're reading you loud and clear, but no picture. We ~~have no modulation~~. do have sync

SC Roger, we understand. Take a look now. How about now, Apollo.

CAPCOM Loud and clear. Good picture.

SC Lovell — What you're seeing has been crossed by sea of the Craters Castner and Gilbert, and what we've noticed especially that you cannot see from the Earth are the small bright impact craters that dominate the lunar surface. The horizon here is very, very stark. The sky is pitch black in the Earth or the Moon rather, excuse me, is quite light. And the contrast between the sky and the Moon is a vivid dark line. Coming into the view of the camera now are some interesting old-double ring craters. Some interesting features, they are quite common in the mare region and have been filled by some material. The same consistency of the other maria and the same color. There are three or four of these interesting features. Further on the horizon you see the Messier. The mountains coming up now are heavily impacted with numberous craters whose central peaks you can see and many of the larger ones. Actually I think the best way to describe this area is a vastness of black and white, absolutely no color. The sky up here is also rather forbidding, foreboding extents of blackness with no stars visible when we're flying over the Moon in daylight. You can see by the numerous craters that this planet has been bombarded through the eons with numerous small asteroids and meteroids pock marking the surface every square inch. And one of the amazing features of the surface is the roundness that most of the craters - seems that most of them have a round mound type of appearance instead of sharp, jagged rocks. All, only the newest of features have any sharp definitions to them, and eventually they get eroded down by the constant

bombardment of small meteroids. How is the picture now, Houston? Houston, are you reading us?

CAPCOM Loud and clear, and the picture looks real fine.

SC Can you see the two large craters just to the right of our track, Houston?

CAPCOM That's affirmative.

SC The very bright features you see are the new impact craters, and the longer a crater has been on the surface of the Moon why the more mottled and subdued it becomes. Some of the -

CAPCOM Apollo 8, we've apparently lost your voice. The picture is still good.

SC Roger. Houston, we're passing over an area that's just east of the Smyth's Sea now in checking our charts. Smyth's Sea is coming up in a few minutes.

CAPCOM Roger. Apollo 8, if you go to POO in accept, we'll uplink some information.

SC We are now coming up towards the terminator, and I hope soon that we'll be able to show you the varying contrast of white as we go into the darkness. Houston, we're POO and you have the computer.

CAPCOM Thank you.

SC We're now approaching a series of small impact craters. There is a dark area between us and them which could possibily be a lava flow. You can see the large mountains on the horizon now ahead of the spacecraft to the north of our track.

PAO We estimated about 325 miles to the horizon just to help your reference.

SC The intensity of the sun's reflection in this area makes it difficult for us to distinguish the features we see on the surface and I suppose even harder on the television. But as we approach the terminator and the shadows become longer you'll see a marked change.

END OF TAPE

SPACECRAFT There is a very dark crater in the filling material that is narrowly in front of us now. It is rather unusual in that it is sharply defined yet it is dark all over its interior walls whereas most new looking craters are of very bright interior. Small impact crater in front of us now in a little ray well defined quite new and another one approaching. The spacecraft is facing North from our track we are going sideways to our left. You are now seeing the Sea of Crises coming over the horizon. We believe the Crater, the large dark crater between the spacecraft and the Sea of Crises is a condorcet crater. The Sea of Crises is amazingly smooth as far as the horizon and pass this rather rough mountainous region in front of the spacecraft.

CAPCOM Apollo 8, we are through with the computer you can go back to Block and it looks like we are getting a lot of reflection off your window now.

SPACECRAFT We'll switch windows. How is that now, Ken? Mattingly

CAPCOM That is real fine.

CAPCOM Apollo 8 can you tell us which window you are looking out there. There is a large crater looks like it is sticking up in the upper right hand corner of our picture Can you identify that one?

SPACECRAFT Rog, you were just about to loose our lock that is why we are slowing up. We see the Sea of Crises in front of us now. You are looking out the left hand rendezvous window. Houston are you reading us now.

CAPCOM Loud and Clear.

SPACECRAFT The crater you see on the horizon is the Sea of Crises. Are you reading us, Houston?

CAPCOM Loud and clear Apollo 8 and we have a picture that is good.

SPACECRAFT Roger. We are getting a lot of static. The Sea of Crises is in front of us on the horizon and the dark crater Picard can be seen in the middle. We are now breaking the Moon's sun rise or the spacecraft's sunset. This is an area that the sun has just recently come up on the moon. Mare we are over now has a mottled look about it but is not very heavily cratered so it must be relatively new. This is the Sea of Fertility and we're coming upon a large crater the delta rim variety. Has a strange circular cracks patterned around the middle of it. The crater that you see now is about 30 or 40 miles across. How is your picture quality, Houston?

CAPCOM This is phenomenal.

SPACECRAFT There is an interesting rill directly in front of the spacecraft now running along the edge of a small mountain. Rather sinuous shape with right angle turns. This area just to the west of the Sea of Crises is called the Marsh of Sleep and to the west of that the Sea of Tranquility. Can you see the fracture pattern going across the mare in front of us now, Houston?

...

CAPCOM That doesn't quite stand out.

SPACECRAFT Roger. The series of cracks or faults across the middle of the Mare they drop down in about 3 steps to the South. The parallel faults pattern to the North and drop down in the center. I hope all of you back down on earth can see what we mean when we say that it is a very forboding horizon, a very rather dark and unappetizing looking place. We are now going over approaching one of our future landing sites selected in this Moon region called the Sea of Tranquility smooth in order to make it easy for the initial landing attempts in order to preclude the having to dodge mountains. Now you can see the long shadows of the lunar sunrise. We are now approaching the lunar sunrise and for all the people back on earth the crew of apollo 8 has a message that we would like to send to you.

END OF TAPE

APOLLO 8 MISSION COMMENTARY, 12/24/68, GET 860615, CST 8:58p 277/1

ANDERS In the beginning, God created the Heaven and the Earth. And the Earth was without form and void and darkness was upon the face of the deep. And the spirit of God moved upon the face of the waters and God said, let there be light. And there was light. And God saw the light and that it was good and God divided the light from the darkness.

LOVELL And God called the light day, and the darkness he called night. And the evening and the morning were the first day. And God said, let there be a firmament in the midst of the waters. And let it divide the waters from the waters. And God made the firmament. And divided the waters which were above the firmament. And it was so. And God called the firmament Heaven. And evening and morning were the second day.

BORMAN And God said let the waters under the Heavens be gathered together in one place. And the dry land appear. And it was so. And God called the dry land Earth. And the gathering together of the waters called He seas. And God saw that it was good. And from the crew of Apollo 8, we pause with good night, good luck, a Merry Christmas and God bless all of you - all of you on the good Earth.

PAO This is Apollo Control Houston. The speakers in the order that they read from what we believe to be chapters from Genesis, were Bill Anders and Jim Lovell and close out with Frank Borman. That's both Biblical and a geological lesson that none of us will for get. At 86 hours and 9 minutes into the flight, this is Apollo Control Houston.

END OF TAPE

PAO This is Apollo Control Houston at 86 hours 18 minutes into the flight. Just a word or two on where the crew is looking. They are - they particularly they identified the tracking extremely well as they moved along. But some of the areas were not so well identified because of the reading which concluded their pass. The reading came while they were moving across Tranquility in a generally westerly direction. The look angle is to the northwest and to a series of mountains, rimming the northwest edge of the Sea of Tranquility. Earlier we, you recall, pointed out the Sea of Crises, concluding that the Picard Craters. And immediately after we lost the picture lock, we went back to work with this update on - with this tape.

SC Well, Ken. We would like to get all squared away for TEI here. Can you give us some good words like you promised?

CAP COM Yes, sir. I have a maneuver PAD. I think we would like to start by dumping the tapes. If we can have that, I have your TEI 10 maneuver PAD and then we will run through a systems briefing.

SC I understand this is a maneuver PAD that we will use for TEI. Is that correct? And you got the tape Houston.

CAP COM Thank you.

SC Ready to copy, Ken.

CAP COM Roger. TEI 10. SPS G&N 45597 minus 040 plus 157089191564 plus 35189 minus 01513 minus 00346 180007000 November Alpha plus 00186352233183501942092825 3 boresight star Scorpi Delta another name for it is Deshuba down 071 left 45 plus 0748 minus 165001299536300146500 5 primary star, Sirius. Secondary Rigel 129155010 four quads 15 seconds ullage. Horizon on the 2.9 window line at T minus 3. Use high-speed procedure with minus Mike Alpha. Over.

SC Okay, TEI PAD as follows: SPS G&N 45597 minus 040 plus 157089191564 plus 35189 minus 01513 minus 00346 180007000 not applicable plus 001863522331835019 420928253 Scorpi Delta Deshuba down 071 left 45 plus 0748 minus 165001299536300146500 5 Sirius Rigel 129155010 four quads 15 seconds 2.9 degrees window line at T minus 3. High-speed procedure minus MA.

CAP COM That's correct Apollo 8.

SC Ken, this is Frank. I want to make one thing certain. This the load that we are to use to burn with? Right? This is not just a PAD data for 10 abort?

CAP COM Okay, Apollo 8. We will update this PAD prior to the burn.

SC Oh you will. Okay.

CAP COM Yes sir.
SC Say again.
CAP COM Apollo 8. Houston. Roger. I am reading you with a lot of background noise. Can you read me clearly?
CAP COM Okay, I am going to give you a quick summary of systems basically, all systems are good. In respect here, return trajectory, we can still get to the mid-Pacific line at 146 hours by waiting as late as the 13th rev. After 138 seconds of the burn, you are on your way home. The weather in the recovery area looks good. Apollo 8, did you call? Apollo 8. Houston. Could we have the high-gain for a little bit longer?
SC We broke scan on it Ken.
CAP COM Okay, you are coming in loud and clear now. Did you copy my trajectory information?
SC We are on omni though.
CAP COM Roger. That is fine.
SC Say again, please. Go ahead. We are 130 - will you say it again please?
CAP COM Wilco. Apollo 8. First - if you can spare, we would like to have the high-gain to complete the dump.
SC Stand by. We will try to get it for you.
CAP COM Roger.
SC In a couple of minutes there, Houston.
CAP COM Roger. Thank you. Okay Apollo 8, while we are - Apollo 8 - while we are waiting for the high-gain I will continue the trajectory summary. We can still get back to the mid-Pacific line in 146 hours from the 13th rev. And you are on your way after 138 seconds of the burn. That's 138 seconds, gets you clear of the butterfly region. We recommend not trying pre-ignition for restart after 20 seconds. If you go beyond 20 seconds, this may get the trajectory beyond the correction - RCS correction capability to the free return. The water in recovery area is good. We have an AOS following TEI of 89 plus 28 plus 39 and an AOS without TEI of 89 plus 37 plus 24. During the burn

END OF TAPE